Thirty 36th Meeting of the
Informal South Pacific ATS Co-ordinating Group
(ISPACG/36)

FANS Interoperability Team Meeting
(FIT/29)

Virtual Meeting
August 10-11 2022

Agenda Item 8: Information Papers

Fello' Fly UPDATE

Presented by **AIRBUS**
Airbus Amber - EC_FR_NL; EC_US_EAR99

SUMMARY

1. INTRODUCTION

1.1 Reduction of environmental footprint is key for the commercial aviation community. Significant technical progress has been made since 2000. Today, Automated Formation Flight operations in cruise applied to civil aircraft is one of the most promising complementary way to reduce fuel burn.

1.2 Automated Formation Flight operations in cruise applied to civil aircraft allow significant fuel burn savings and associated CO2 emission reduction without additional ground infrastructures or aircraft sensors. The Automated Formation Flight concept is inspired by the V-shaped formations of migrating geese, who have naturally found a way to save energy whilst flying long distances.

1.3 As the "Formation Flight" name generated frequent confusion with "Close Proximity" military operations, it was decided to rename the program as "Fello'fly".

2. DISCUSSION

2.1 The value of Fello'fly is basically linked to the local fuel savings obtained for the follower aircraft while surfing the vortex. The principle relies on harvesting a part of the energy from the wake vortex generated by a leading aircraft, by actually surfing it. Whilst wake turbulence is commonly considered as a threat for commercial airplanes, this concept aims at taking benefit from the energy contained in trailing vortices, without compromising safety (which is paramount). Thus, positioning a trailing aircraft in a right way in the area where the vortex pushes air upward enables the trailing aircraft to save fuel.

2.2 At aircraft level, airborne functions are developed to automatically position and maintain the trailing aircraft in the optimum position near the vortex generated by a leader aircraft, while guaranteeing a protection with regard to wake vortex encounter and mid-air

collision risks.

2.3 Several workshops have been carried out with EASA, ANSPs and supportive airlines to prepare the test campaigns.

2.4 In July 2020, a first flight test campaign validated all elements of the concept (vortex position estimator, automated capture and tracking functions through dedicated aircraft system).

2.5 In March 2021, a second flight test campaign confirmed fuel and emissions reductions in line with models. In addition, airborne functions for automated vortex capture and tracking were tested at different altitudes and separations.

2.6 In September 2021, Airbus and partners continued testing automated aircraft functions to capture and track the vortex of a leader aircraft, this time in representative atmospheric conditions. The objective was to demonstrate stable and automated tracking and prepare for the North Atlantic trials at the end of 2021.

a) During this new campaign, for the first time, a fello'fly pair has flown in General Air Traffic conditions, with French (Brest) and UK (Prestwick) Air Traffic Control.

b) Based on previous CONOPS and ATM Safety assessment work, NATS and DSNA have coordinated with their National Authorities (DSAC and UK CAA) to provide the necessary authorizations. Safety studies have been performed to manage fello'fly operations in General Air Traffic conditions with legacy tools.

c) A specific VHF frequency has been allocated by French and UK frequency management authorities for the necessary coordination between crews. Standard ATC communication has been used.

d) A dedicated phraseology has been defined and shared with involved Airbus Pilots, DSNA & NATS Air Traffic Controllers, and IAA.

e) Rendezvous and split procedures have been experienced in both Brest and Shanwick airspaces.

f) The pair has crossed the border between Brest and Shanwick airspaces in formation under the coordination of French DSNA and NATS Prestwick Air Traffic Controllers.

2.7 In November 2021, an operational flight trial, across the North Atlantic airspace, using the same Airbus Flight Test A359 MSN1 as Leader A/C and A35K MSN59 as Follower A/C have been performed and operated by Airbus Flight Test Crews:

a) A round-trip demonstration has been performed from Toulouse (LFBO) to Montreal (CYUL), and has therefore flown through French Brest airspace, across Shanwick and Gander oceanic airspaces, and enter the Canadian domestic airspaces (Gander domestic, Moncton and Montreal) to Montreal. The return flight has been done within the same airspaces.

b) Rendezvous and split maneuvers have been performed either in Brest domestic area and Canadian domestic airspaces.

c) ANSPs directly involved in this flight trial were: French DSNA, UK NATS, NAVCANADA, and Irish IAA.

2.8 The operational trial outcomes were the following:

a) These two first transatlantic flights of a pair of aircraft, one surfing the vortex of the other, have been considered a real success. At least 2 tons of fuel (6T of CO^2) was saved during each flight. Global fuel saving efficiency has been confirmed to be around 5%.

b) Flight crew underlined the very good cooperation with all ATC centers: NavCanada, DSNA, NATS, IAA, who all played a very active role in the success of the mission.

c) A total of 11h20 (round-trip) of automatic formation flight has been realized providing several operational feedbacks to enhance or discuss further the concept of operations (e.g. phraseology, datalink).

d) In both flights, MSN01, the leader flew in managed modes at M0.85 and 1.2NM ahead of the follower.

e) In both flights, Data Communication between Aircrafts was ensured through "ADS-B" like data protocol therefore using a standardized short range data communication mean.

f) From the ICAO and SAS observers, that were onboard to witness the flight, a very good feedback was received on:

i) Comfort when harvesting the vortex, at every seat position of the aircraft: Nose / Mid / Tail section.

ii) Efficiency of the implemented functions to automatically reach and fly Rendez-Vous, Vortex Free, and Optimum position,

iii) Efficiency of the implemented safety nets to keep sufficient margins toward the Vortex.

g) Several operational feedbacks on operations, phraseology and datalink were obtained from the trial and will enrich the future activities on this topic.

2.9 Airbus has started discussions regarding implementation with NAT HLA stakeholders through the different groups including POG (Procedure and Operations Group), SOG (Safety Oversight Group), IMG (Implementation Management Group) and SPG (System Planning Group).

2.10 Airbus prepares a working paper for the upcoming 41st ICAO Assembly to seek further implementation support.

3. CONCLUSION

3.1 The meeting is invited to note the information provided.

3.2 More details on Fello' Fly Oceanic Concept of Operations can be discussed with guillaume.molinier@airbus.com and philippe.masson@airbus.com

-- END --